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## CLAIMS

What is claimed is:

- 1           1.       A process for fabricating an interconnect structure on an electronic device  
2       with copper conductor substantially free of internal seams or voids which comprises:  
3           forming an insulating material on a substrate;  
4           lithographically defining and forming recesses for lines and/or vias in the  
5       insulating material in which interconnection conductor material will be deposited;  
6           depositing a barrier layer against copper diffusion;  
7           depositing a current carrying copper seed layer;  
8           depositing the copper conductor by electroplating from a bath containing a  
9       dissolved cupric salt wherein the concentration of the cupric salt is at least about 0.4  
10      molar and an acid and wherein the bath has an acidic pH.
- 1           2.       The process of claim 1 wherein the concentration of the cupric salt is at  
2       least about 0.8 molar.
- 1           3.       The process of claim 1 wherein the cupric salt comprises  $\text{CuSO}_4$ .
- 1           4.       The process of claim 1 wherein the concentration of the acid is an amount  
2       up to about 0.5 molar.
- 1           5.       The process of claim 1 wherein the concentration of the acid is about 0.1  
2       to about 0.25 molar.
- 1           6.       The process of claim 4 wherein the acid is sulfuric acid.
- 1           7.       The process of claim 1 wherein the electroplating bath has a pH of up to  
2       about 5.

1           8.     The process of claim 1 wherein the electroplating bath has a pH of about  
2     0.6.

1           9.     The process of claim 1 wherein the electroplating bath contains at least  
2     one auxiliary additive selected from the group consisting of brightener, leveling agent,  
3     ductility enhancer and stress reducer.

1           10.    The process of claim 1 wherein the electroplating bath is free of  
2     complexing agents.

1           11.    The process of claim 1 wherein the substrate is coupled to a plating power  
2     supply with the current enabled before introducing the substrate into the bath.

1           12.    The process of claim 11 wherein the initial current of the power supply is  
2     lower than the current of the electroplating of copper from the bath onto the substrate.

1           13.    The process of claim 12 wherein the initial current is maintained for up to  
2     about 40 seconds.

1           14.    The process of claim 1 wherein the electroplating is carried out at a current  
2     density of about 10 to about 50 mA/cm<sup>2</sup>.

1           15.    The process of claim 13 wherein the initial current is about 1-5 mA/cm<sup>2</sup>.

1           16.    The process of claim 1 which further comprises depositing a barrier layer  
2     on sidewalls and bottom surfaces of the lines or vias, and depositing a metal seed layer  
3     prior to electroplating the copper.

1           17.    The process of claim 16 wherein the metal seed layer is copper.

1           18.     The method of claim 1 wherein the vias or lines have dimensions of about  
2     0.275  $\mu\text{m}$  or less and aspect ratios of at least about 3.

1           19.     The method of claim 1 which further comprises planarizing or chemical-  
2     mechanical polishing after the electroplating.

1           20.     A copper damascene structure having an aspect ratio of greater than about  
2     3 and a width of less than about 0.275  $\mu\text{m}$  which comprises:  
3             a substrate having a dielectric layer having a via and/or line opening therein;  
4             the via and/or line opening having a liner or barrier layer on sidewalls and bottom  
5     surfaces of the via opening;  
6             a metal seed layer on the liner or barrier layer; and  
7             wherein the via and/or line opening is filled with electroplated copper that forms a  
8     continuous interface with the liner or barrier layer and being substantially free of internal  
9     seams or voids.

1           21.     An interconnect structure obtained by the process of claim 1.

1           22.     An electroplating copper bath comprising dissolved cupric salt at a  
2     concentration of at least about 0.4 molar, up to about 0.5 molar concentration of an acid  
3     and having an acidic pH.

1           23.     The bath of claim 22 being free of complexing agent.

1           24.     The bath of claim 23 wherein the cupric salt concentration is at least about  
2     0.8 molar.